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(56) Documents cited
GB 2249061 A **WO 90/15713 A1** **US 5071161 A**
US 4500114 A **US 3937488 A**

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(54) **Air permeable vehicle air bag**

(57) At least a part of an air bag is made of an air permeable cloth comprising a woven fabric of which the warps and wefts are bonded with a resin or rubber to prevent slipping thereof. Preferably the air permeable portion is at the air inlet end of the bag and constitutes 30–60% of the total surface area of the bag. The bonding agent may be a silicone resin, chloroprene rubber, urethane rubber, butyl rubber or compositions thereof and the warp and weft fibres may be polyamide or polyester. The resin may be coated over the woven fabric in a lattice pattern, alternatively the fabric may be impregnated with a liquid resin. In another embodiment the warps and wefts are previously impregnated or are surface coated, and the resultant cloth is heat treated to bind the warps and wefts. Finally, the cloth may be prepared using a thread with a core of relatively high melting material and an outer layer of low temperature melting material and then heat treated.

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FIG.1

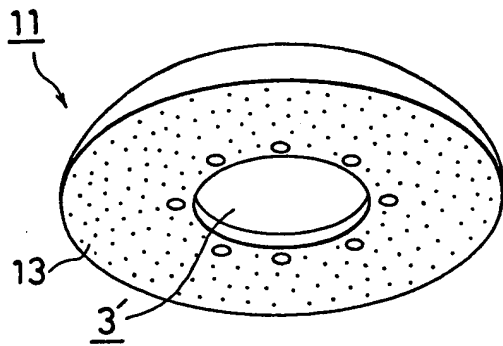


FIG.2

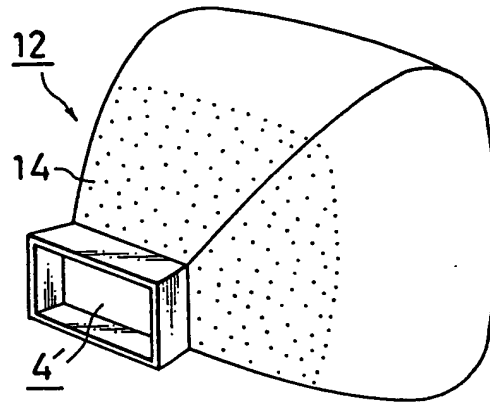


FIG.3

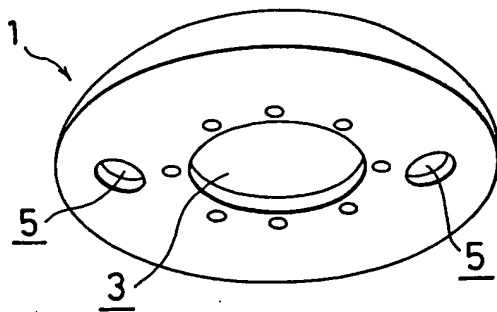


FIG.4

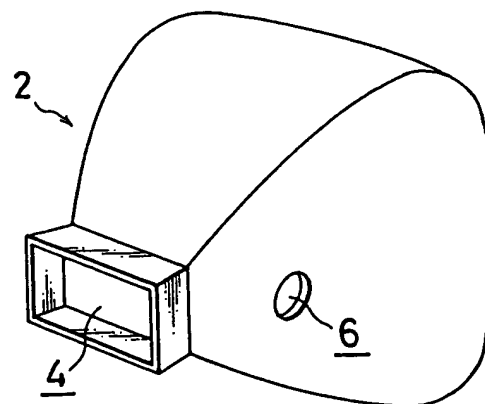


FIG. 5

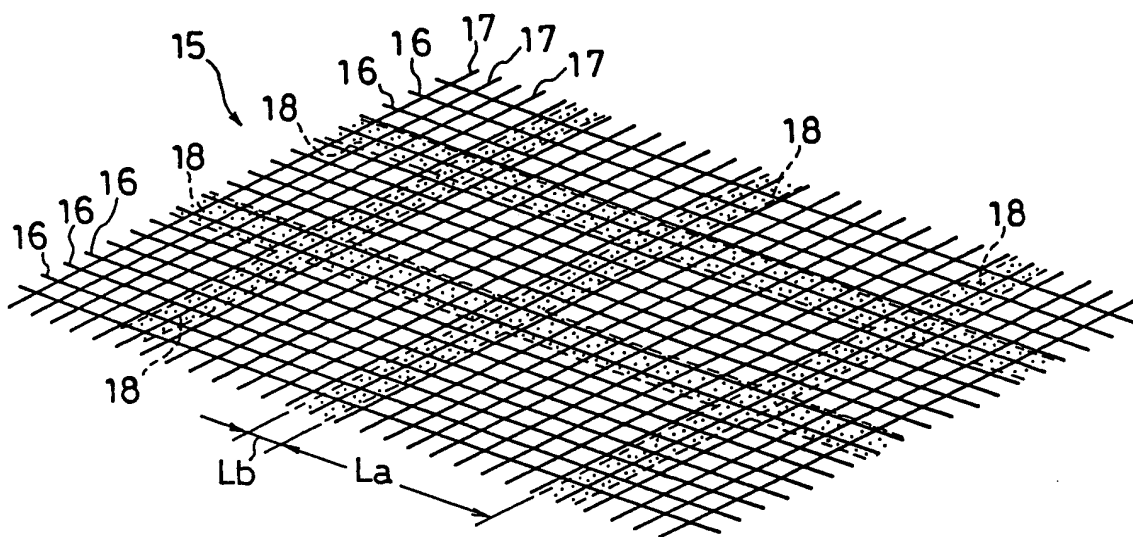


FIG. 6

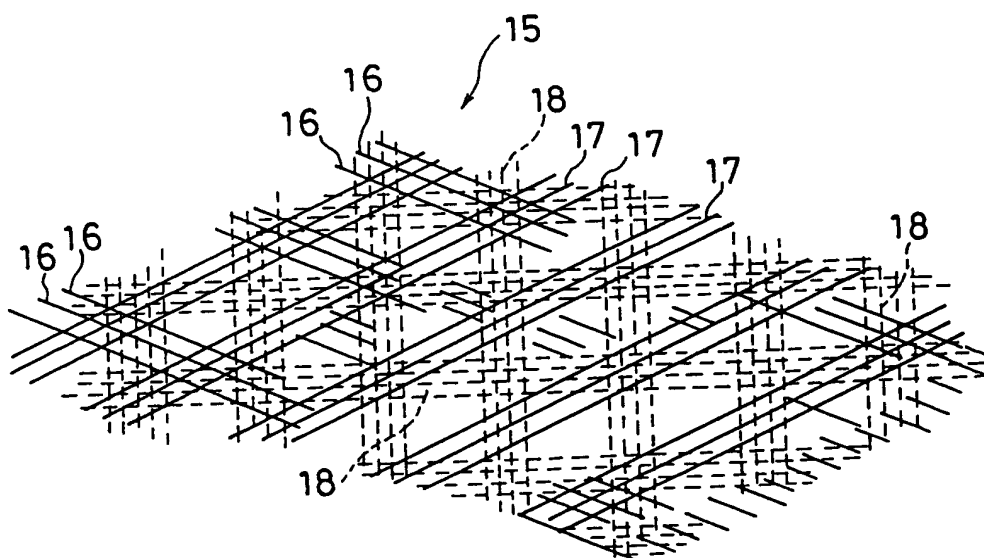
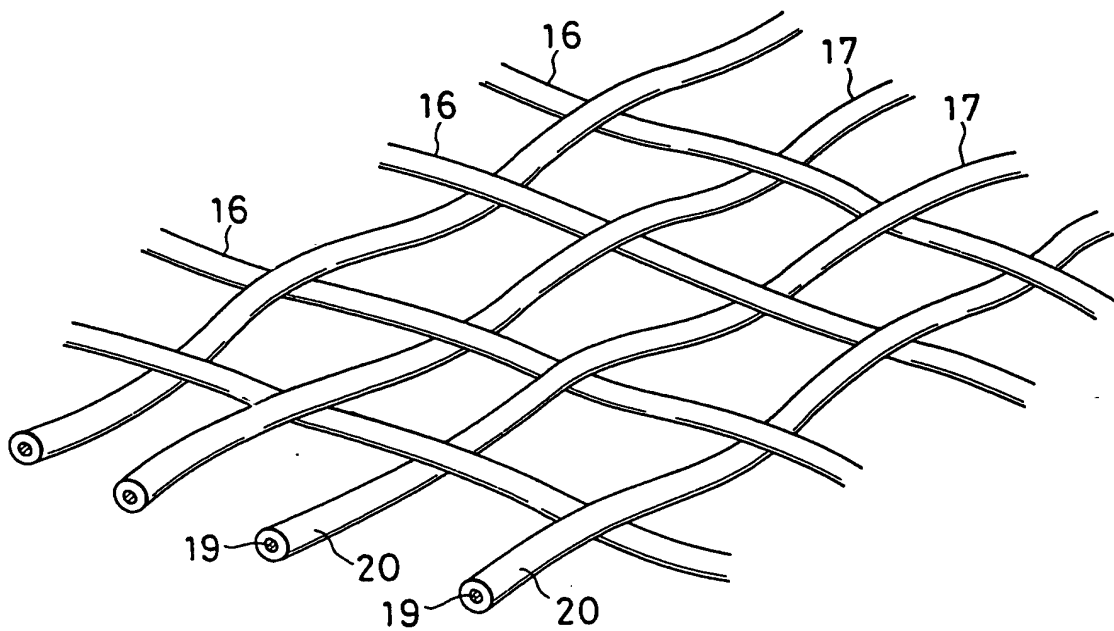


FIG. 7



Title of the Invention

AIR BAG

Field of the Invention

The present invention relates to an air bag of an air bag device retained in a vehicle for protecting an occupant when a vehicle collides. More particularly, it relates to an air bag having no vent holes.

Description of the Related Art

Fig. 3 is a perspective view showing an extended state of an air bag 1 for a driver's seat and Fig. 4 is a perspective view showing an expanded state of an air bag 2 for a passenger's seat.

These air bags comprise openings 3 and 4 where an inflator is inserted directly at the rear end portion thereof or where discharge gas from the inflator is introduced. In addition, vent holes 5 and 6 are formed at rear sides. When an occupant is forced into the extended air bag 1 or 2, the gas within the air bag flows out of the air bags through the vent holes 5 or 6 to absorb impact on the human body forced into the air bag.

By forming these vent holes, fine particles included in an exhaust gas from the inflator may sometimes flow out of the air bag. Thus, in prior arts, it has been proposed that the rear portion of the air bag is made of an air permeable cloth rather than using the vent hole.

In the Official Gazette of Japanese Utility Model Registration Unexamined Prepublication No. 22360/1983, an air bag is proposed that is constructed by a bag assembly which is made by means of integrally sewing an airtight bag portion and an air permeable portion made of cloth or the like. The air permeable portion has a filtering function for filtering the above mentioned fine particles.

The air permeable portion is generally made of woven fabric. The woven fabric is coarsely textured with spaced warps and wefts. Thus, the warps and wefts slide and a partially coarse-textured portion or a close-textured portion may be generated. Accordingly, the air permeability is locally increased at the coarse-textured portion and the fine particles which should be filtered may pass therethrough. On the other hand, the air permeability is decreased at the close-textured portion and there is a problem that it is difficult to achieve the desired amount of air permeability.

Object and Summary of the Invention

It is an object of the invention to provide an air bag comprising a rear portion which is made of cloth having a uniform air permeable property in its entirety.

An air bag of a first aspect is made, at least a part thereof, of an air permeable cloth. The air permeable cloth is constituted by a woven fabric. At least a part of warps and wefts of the woven fabric are bound with at least one of a resin and a rubber.

An air bag of a second aspect is characterized in that, in the air bag of the first aspect, the bound portion of the fabric is formed as a lattice pattern.

An air bag of a third aspect is characterised is that, in the air bag of the second aspect, each lattice axis of the bound portion formed as the lattice and each thread axis of the woven fabric are crossed with each other at an inclined angle of 30 to 60°.

In the air bag of the first aspect, the resin bound portion where the warps and the wefts are bound with the resin is formed over a portion of the woven fabric. Thus, it is possible to prevent sliding of the warps and the wefts in a non-bound portion.

In the air bag of the second aspect, the resin bound portion is formed as the lattice. Thus, there is a large effect on preventing sliding of the warps and the wefts in the non-bound portion (coarse lattice portion).

In the air bag of the third aspect, each lattice axis of the resin bound portion and each thread axis of the woven fabric is crossed at an angle of 30 to 60°. Thus, there is a larger effect on preventing sliding of the warps and the wefts in the non-bound portion (coarse lattice portion).

Brief Description of the Drawings

Fig. 1 is a perspective view of an air bag for a driver's seat according to an embodiment.

Fig. 2 is a perspective view of an air bag for a passenger's seat according to an embodiment.

Fig. 3 is a perspective view of an air bag for a driver's seat according to a prior art.

Fig. 4 is a perspective view of an air bag for a passenger's seat according to a prior art.

Fig. 5 is a perspective view for use in describing a cloth applied to an air bag according to an embodiment.

Fig. 6 is a perspective view for use in describing a cloth applied to an air bag according to an embodiment.

Fig. 7 is a perspective view for use in describing a cloth applied to an air bag according to an embodiment.

Preferred Embodiments

An embodiment will be described below with reference to the drawings.

Figs. 1 and 2 are perspective views showing extended states of air bags 11 and 12 according to an embodiment of the present invention. Rear portions 13 and 14 of the air bags are made of air permeable woven cloths. Openings 3' and 4' have the same function as openings 3, 4 of the prior art.

For the air bag, a region made of the air permeable cloth lies at the rear portion of the air bag and its is preferable that the region is in the range of about 30 to 60%, and more preferably, 35 to 50% of the total surface area.

Preferably, the quantity of airflow through the air permeable cloth ranges from 10 to 200 cc/cm²/sec, and more preferably from 20 to 60 cc/cm²/sec

For the warps and the wefts of the woven fabric, synthetic fibres such as polyester or polyamide such as nylon (trade name) of 210 to 840 deniers are suitable.

The warps and the wefts are bound by at least one of a resin and a rubber.

Methods for binding the warps and the wefts by using the resin are exemplified by the following examples (1) through (4).

(1) As shown in Fig. 5, the resin is coated over a woven fabric 15 as a lattice pattern. The dotted region 18 in Fig. 5 is the region where the resin is coated. 16 represents warps and 17 represent wefts.

In this event, the coarse-textured size L_a of the resin lattice pattern is preferably in the range of 0.5 to 50mm, and more preferably, in the range of 1 to 30mm. Further, a width of one lattice L_b is preferably in the range of 0.5 to 50mm, and more preferably, in the range of 1 to 30mm.

The coarse-textured size of the lattice and the width of the lattice are properly determined depending on, for example, the shape of the air bag, size of the warp and the wefts, and the properties of the resin to be used.

The resin can be either a thermosetting or a thermoplastic one. The resin or rubber is preferably one selected from the group comprising silicone resin, chloroprene rubber, urethane rubber, butyl rubber, a copolymer thereof and/or a composition thereof.

In Fig. 6, the resin is coated so that the lattice axis of the lattice and the thread axis of the woven fabric cross at an angle of 45°.

(2) The woven fabric is impregnated with a liquid resin to make the resin adhere to the warps and the wefts by means of drawing up, coating or lamination. Subsequently, the resin is cured to bind the warps and wefts at substantially every crossing thereof.

A vent which penetrates the resin from the outer surface to the inner surface is formed so as to provide air permeability.

The resin or rubber is preferably selected from the group comprising of silicone resin, urethane resin, butyl rubber, and a copolymer thereof and a composition thereof.

Preferably, the amount of resin or rubber for every 1m^2 of cloth ranges from about 1 to 100 g, and more preferably, ranges from about 5 to 60 g.

A coated cloth having the above mentioned air permeability exhibits the property of allowing the gas constituent in the gas supplied from the inflator to pass therethrough while resisting the passage of any particulate matter in the gas from the inflator.

(3) The warps and the wefts are either previously impregnated with the thermoplastic resin or are surface-coated. After making a cloth using these warps and wefts, it is heated to melt and bind the warps and wefts with the resin.

For this resin, a thermoplastic resin is preferable such as polyethylene, polystyrene or polyamide. In the case where the threads are impregnated with the resin, the loading amount is preferably in the range of about 1 to 100 g for every 1m^2

cloth. In the case where the resin is coated on the surface of the thread, the amount is preferably in the range of about 1 to 70 g for every 1m^2 cloth.

(4) A double-structured thread is used for at least one of the warps and the wefts.

After making the cloth by using the double-structured thread, it is heated to be welded.

In the double-structured thread, as shown in Fig. 7, a core 19 is made of a high-melting temperature material and a periphery 20 is constituted by a low-melting temperature material.

For the material of core 19, a polyamide such as nylon (trade name) is preferable. For the material of periphery 20, polyethylene or polystyrene are preferable.

After making the cloth, it is heated to a temperature lower than or equal to the melting point of the core and higher than or equal to the melting point of the periphery to weld the warps and the wefts together.

As mentioned above, by means of binding the warps and the wefts with a resin, it is possible to prevent the warps and the wefts from sliding or slipping and the entire cloth possesses a uniform air permeable property. Thus, the air permeable property at the rear portion becomes uniform. In addition, the particles in the discharge gas from the inflator can be positively filtered. Further, the cutting and sewing operation can be readily made without substantial fraying of the cloth.

According to the present invention, it is possible to adjust air permeability of the cloth by means of increasing or decreasing the amount of the resin to be adhered to the air permeable cloth.

WHAT IS CLAIMED IS:

1. An air bag at least a part of which is made of an air permeable cloth, wherein said air permeable cloth is constituted by a woven fabric, and at least a part of the warps and wefts of said woven fabric are bound together with a bonding material of at least one of a resin and a rubber so that said warps and wefts are prevented from sliding and slipping.

2. An air bag as claimed in claim 1, wherein a region made of the air permeable woven cloth lies at the rear portion of said air bag, and the region is in the range of about 30 to 60% of the total surface area of said air bag.

3. An air bag as claimed in claim 1, wherein the quantity of airflow through the air permeable cloth ranges from 10 to 200 cc/cm²/sec.

4. An air bag as claimed in claim 1, wherein the material for the warps and the wefts of said woven fabric is at least one of polyamide and polyester of 210 to 840 deniers.

5. An air bag as claimed in claim 1, wherein the bonding material is bound to said woven fabric as a lattice.

6. An air bag as claimed in claim 5, wherein each lattice axis of the said bonding material formed as the lattice and each thread axis of said woven fabric are crossed with each other at an inclined angle of 30 to 60°.

7. An air bag as claimed in claim 5, wherein the coarse-textured size of said lattice is in the range of 0.5 to 50mm.

8. An air bag as claimed in claim 5, wherein the width of one lattice is in the range of 0.5 to 50mm.

9. An air bag as claimed in claim 5, wherein the bonding material is selected from the group comprising silicone resin, chloroprene rubber, urethane rubber, butyl rubber, a copolymer of at least two thereof and a composition of at least two thereof.

10. An air bag as claimed in claim 5, wherein said warps and the wefts of said woven fabric are bonded at substantially every crossing thereof by the bonding material.

11. An air bag as claimed in claim 10, wherein said bonding material is selected from the group comprising silicone resin, chloroprene rubber, urethane rubber, butyl rubber, a copolymer of at least two thereof and a composition of at least two thereof.

12. An air bag as claimed in claim 10, wherein the adhesion amount of said bonding material for every 1m^2 of cloth ranges from 1 to 100g.

13. An air bag as claimed in claim 10, wherein said bonding material is a thermoplastic resin which is coated on said fabric beforehand.

14. An air bag as claimed in claim 13, wherein said resin is at least one of polyethylene, polystyrene and polyamide.

15. An air bag as claimed in claim 13, wherein the loading amount of impregnated resin in said fabric is in the range of about 1 to 100g for every 1m^2 of cloth.

16. An air bag as claimed in claim 13, wherein the amount of coated resin on said fabric is in the range of about 1 to 70g for every 1m^2 of cloth.

17. An air bag as claimed in claim 10, wherein the fibres of said fabric have a core and a periphery being made of a material which has a lower melting temperature than said core, and both peripheries of said warp and said weft fabric are welded.

18. An air bag as claimed in claim 17, wherein said core of said fabric is made of at least one of polyamide and polyester, and said periphery thereof is made of a thermoplastic resin.

19. An air bag substantially as hereinbefore described with reference to the accompanying description and Figure 1; or Figure 2; or Figure 5; or Figure 6; or Figure 7 of the drawings.

Patents Act 1977
Examiner's report to the Comptroller under
Section 17 (The Search Report)

Application number

GB 9305471.6

Relevant Technical fields

(i) UK CI (Edition L) B7B (BSB)

(ii) Int CI (Edition 5) B60R 21/16

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASE: EDOC, WPI

Search Examiner

PAT EVERETT

Date of Search

30 APRIL 1993

Documents considered relevant following a search in respect of claims ALL

Category (see over)	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2249061 A	(TAKATA) Note page 8, reference to cloth 3, and Figure 3	1, 2
X	WO 9015713 A1	(GORE) Note use of adhesive dots 20 in layer 5	1, 2
X	US 5071161 A	(MAHON) Note column 4, lines 29-35	1
X	US 4500114 A	(GREY) Note column 3, lines 47-65	1
X	US 3937488 A	(WILSON) Note column 3, lines 3-8	1

Category	Identity of document and relevant passages	Relevant to claim(s)

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